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Highlight: Both climate advocates and deniers of global warming are increasingly using bouts of extreme weather

to support their positions.

Body

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WASHINGTON — In the summer, when heat waves scorch cities or heavy rains flood the coasts, some climate scientists and environmentalists will point out any plausible connections to global warming, hoping today's weather will help people understand tomorrow's danger from climate change.

Then winter comes. And, like clockwork, those who want to deny the established science that humans are warming the planet will try to flip the script. In January, when large swaths of the country were gripped by bitter cold, President Trump took to Twitter to mock climate fears: "Wouldn't be bad to have a little of that good old fashioned Global Warming right now!"

Welcome to the weather wars. As battle lines harden between supporters and opponents of climate action, both are increasingly using bouts of extreme weather as a weapon to try to win people to their side. Weather, after all, is one of the easiest things for people to bond over or gripe about, a staple of small talk and shared experience that can make it a simple but powerful opportunity to discuss global warming.

But, as Mr. Trump's words show, it's also a framing device that can be easily abused. That raises the stakes for how scientists, who have long tried to distinguish between short-term weather fluctuations and long-term climate shifts, draw out and discuss the links between the two.

"Weather, and especially extreme weather, is how most people will experience climate change," said Susan Joy Hassol, director of the science outreach nonprofit group Climate Communication. "You don't experience the slow change in average temperature. What you experience are the changes in extreme weather that are brought about. So how we talk about that is really important."

One reason that the weather can offer a potent messaging opportunity may boil down to human psychology. Climate science itself is often complex and abstract. It can be tough to feel, on a gut level, the implications of a chart showing global temperatures ticking up over time, or statistics showing that, on average, 95-degree days or torrential downpours are becoming more frequent.

But an unusual weather event that hits today, like a brutal heat wave or heavy storm, is more visceral. Laboratory experiments have found that people's beliefs about global warming can be swayed by their immediate environment. Put someone in a hot room and they're more likely to agree the planet is warming. Thirsty people become more alarmed by drought forecasts.

Psychologists have suggested these visceral experiences make it easier for our brains to imagine future states of the world, and therefore make them seem more likely. An exceptionally hot or cold day, other studies have found, can play the same role.

Some messengers have long realized that emotion and immediacy can be a powerful force.

"Trump is a branding guy," said David B. Srere, co-chief executive and chief strategy officer at Siegel+Gale, a brand consultancy. "He knows his audience and understands how to tell a clear, simple story. Climate advocates and the scientific community need to get better at understanding their audience and figure out how to tell a simple, repeatable story of their own."

In recent years, some climate scientists have focused on trying to turn flare-ups of severe weather into teachable moments. "This is what global warming looks like," scientists said during the summer of 2012, a season of widespread droughts, wildfires and extreme heat advisories.

And they have become increasingly comfortable drawing those connections.

Back in 2005, after Hurricane Katrina devastated New Orleans, many researchers responded cautiously, saying it was difficult to attribute a single event to global warming. A few noted that rising ocean temperatures could make hurricanes more destructive, on average, in the future. But even that was fairly abstract.

Over time, that messaging has shifted.

Partly that's because, as climate models have improved, scientists have been able to demonstrate more rigorously how rising greenhouse gas emissions have made recent heat waves or droughts more intense or more likely to occur — a budding field known as "extreme weather attribution." Scientists have also refined their communication strategies, using metaphors like "loaded dice" to talk about how global warming is now making certain severe weather events more likely.

"The conversation today couldn't be more different than it was a decade ago," said Hunter Cutting, director of strategic communications for Climate Nexus, a nonprofit group focused on climate issues. "Back then, at best, you might get scientists talking about what effects we could see by the year 2100. Now we're seeing leaders connect the dots in a much more direct way."

That strategy, though, can cut both ways. Deniers of climate change have also sought to use the daily weather to shape perceptions. Senator James Inhofe, Republican of Oklahoma, once brought a snowball to the Senate floor to suggest that global warming wasn't a problem. When cold spells strike, Mr. Trump will ridicule worries about climate change:

Parrying Mr. Trump's tweets can be a challenge, some supporters of action on climate change concede. He can drive the conversation: One recent survey from Media Matters, a liberal watchdog group, found that broadcast television networks rarely discuss global warming when extreme weather is unfolding. But they do often note the president's climate comments.

Scientists and environmentalists have tried various tactics to push back. They might note that record hot days are becoming far more frequent than record cold days, and that no one expects global warming to eliminate snow altogether. Or they'll reiterate that the ups and downs of daily weather aren't the same as broader long-term shifts in the Earth's climate, and that a single cold day can't disprove global warming anymore than a single hot day proves it.

Still, a casual observer could be forgiven for feeling a bit of whiplash after that line. After all, haven't we been hearing that severe weather is a manifestation of climate change when it's hot out?

Marshall Shepherd, a professor of atmospheric science at the University of Georgia, isn't convinced that the president's tweets about cold weather have staying power.

"I see Trump's tweets as an opportunity to discuss the science," he said. "To the 9 or 10 percent of the population that are going to be dismissive of climate science no matter what, there's not much you can say to them. But a lot of people out there are legitimately curious" about how global warming can be real if it's cold out today.

That raises the question of whether the messaging skirmishes around severe weather and climate change are swaying public perceptions, or whether each side is just preaching to those who are already converted.

There are some signs opinion is shifting. One recent survey by researchers at Yale and George Mason University found that 69 percent of Americans were "worried" about global warming, an 8-point increase from the previous spring. One possible explanation, the researchers suggested, was the spate of extreme weather disasters in 2018, from wildfires to hurricanes, along with increased efforts by scientists and even local TV weathercasters to put that in a climate context.

"For a long time, Americans saw climate change as a distant threat," said Edward Maibach, a professor at George Mason who works on climate change communication. "But as of our most recent survey, I don't feel I can say that anymore. We're seeing a lot of movement on people understanding that climate change is already happening."

Others are more cautious about interpreting these trends. One 2017 study, for instance, found that people who experience extreme weather are, for a short period, more likely to support climate adaptation measures than they were before. But the effect was modest and diminished over time.

It may be that people mentally adjust to unusual weather patterns quickly, updating their idea of what counts as normal. Politics may also play a role: In a polarized country, many Americans are already hardened in their beliefs about global warming.

Partly for that reason, David M. Konisky, an associate professor in the School of Public and Environmental Affairs at Indiana University and an author of that 2017 study, said he wonders whether better messaging can dramatically shift opinions. "It might be that climate has become so wrapped up in one's identity and worldview that it's not the sort of thing that's susceptible to better messaging," he said.

Wanyun Shao, an assistant professor of geography at the University of Alabama, lands in the middle. Her research has found that Democrats and Republicans do perceive severe weather differently: Democrats tend to see it as part of a broader pattern of climate change, Republicans as more of an aberration. But, she has also found, a consistent string of shifting weather — year after year of increasing summer heat, for instance — does start to chip away even at conservative doubt about global warming.

"For some people, it takes more time," she said. "But eventually people start trusting their own experiences."

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PHOTO: Clearing snow in Buffalo, N.Y., in January. (PHOTOGRAPH BY Lindsay Dedario/Reuters FOR THE NEW YORK TIMES)

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